

PROFESSIONAL DEVELOPMENT

Testing the Usability of Communication Materials through Heat Maps in Online Survey Platforms

Laura M. Gorham, Shuyang Qu, Ricky W. Telg, and Alexa J. Lamm

ABSTRACT

Usability tests can be used to enhance the communication strategies of agricultural organizations as they identify the use and value of a communications tool from a target audience's perspective. Further, online survey methodology has provided a place where communicators can gather information from a diverse target audience. One way communicators can create a usability test in online surveys is through the use of heat map questions. Heat map questions provide a platform where agricultural communication professionals and researchers can identify how well a target audience uses a communication material. By merging heat maps and value-based questions, researchers and communicators can evaluate the usability and value of a communication material. Heat maps allow agricultural communicators to evaluate communication materials such as websites and fliers, gather users' feedback and identify strategies to enhance agricultural communication materials. This article provides steps to incorporate heat map questions into online survey, tips for using heat map tests, and methods to interpret heat map results.

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KEY WORDS

Heat Map, Survey Methods, Usability Testing, Value Testing

INTRODUCTION

Agricultural communicators recognize the need for using effective communication and distribution methods that best inform, motivate, and serve their clients (Telg, Irani, & Varvorines, 2008). Goodwin and Rhoades (2011) found the agricultural industry fails to communicate effectively with non-agricultural audiences, and therefore, the agricultural industry needs to find ways to increase effective communication strategies. Research has addressed the use of communication audits in determining how communication messages could be improved (Goodwin, Davis, & Telg, 2014). However, communication audits could be strengthened when paired with tests to determine the use and value from a target audience (Goodwin et al., 2014). This article provides a rationale for the need for usability tests to determine how a target audience perceives the communication material. Additionally, the article describes how heat map questions are utilized to perform usability testing in online survey methods, tips to use heat maps in usability tests, and methods to interpret heat map results.

Usability Testing

Agricultural communication professionals should design communication messages based on how a target audience uses and values the information they find in the communication materials (Dimas & Redish, 1999). Usability testing is an evaluation technique measuring how easily a target audience member can learn the information in the communication material and then make use of the information to accomplish a task (Dumas & Redish, 1999; Goodwin et al., 2014). These tests evaluate users' perceptions of ease and value in order to find out the usefulness of the communication material and identify potential improvements that could increase effectiveness and efficiency for both stakeholders and the public (Dumas & Redish, 1999; Goodwin et al., 2014; Rubin & Chisnell, 2008).

Heat Maps

Communicators can measure the usability of their communication materials by using heat maps embedded in online surveys, and thereafter enhance communication materials. For example, when creating Web pages, heat maps can be adopted to determine which parts of a page visitors click on the most. Understanding users' most frequent clicks helps developers to assess what images or text draws people's attention more on that Web page. In an online survey with a heat map question, the image of a piece of communication material can be uploaded and presented to the respondents. The respondent will click on an image on the computer screen to determine numerous usability functions (Qualtrics, 2015a).

For example, in Figure 1 the heat map shows that more people click on the banana image more than anywhere else on the computer screen, followed by the "Don't Pack a Pest" button at the top of the screenshot.

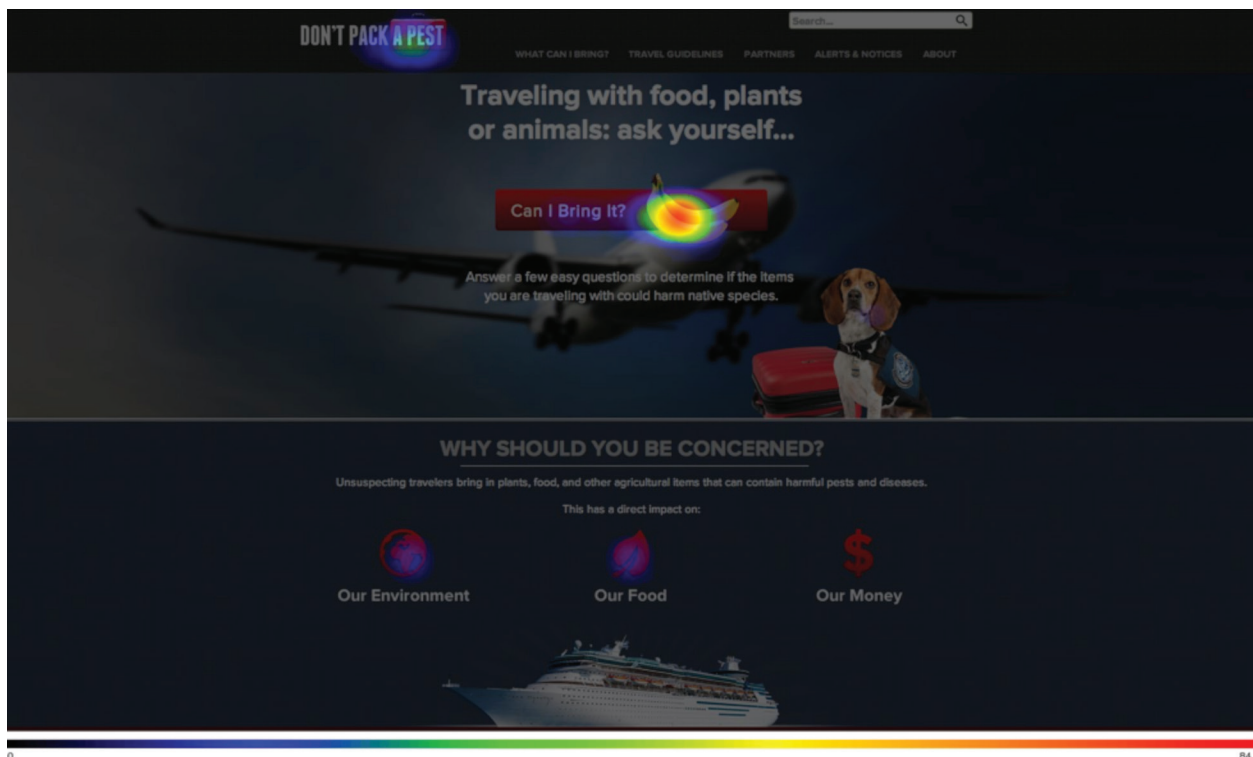


Figure 1. Screen capture of heat map overlay on desktop image.

A timing question, which records how long the task takes to complete, can be integrated into a heat map question to provide researchers information about the degree of functionality associated with the website (Qualtrics, 2015a). Value questions can also be added to determine users' perceptions toward the communication materials. Combining timing

and value questions allows communicators to gather information and determine the ease of respondent use of the communication material. Researchers can use this method to improve communication strategies targeted toward how the communication material is being used and valued by its audience.

Applying Heat Maps as a Usability Test: An Example

To use heat maps to perform a usability test, communicators need access to a communication material, access to an online survey platform, and access to a sample of respondents who would be most likely to view the communication material (the target audience). A number of survey software programs provide heat map functions including Qualtrics (2015a), AirMagnet Survey (2015), Survey Analytics (2015), and SurveyGizmo (2013).

Heat maps were recently used in a study to evaluate the usefulness of a website designed to provide educational resources regarding invasive species transferred on agricultural products to international travelers. The study used heat maps to determine the usefulness of the website on mobile (smartphone), tablet, and desktop platforms. A timing question was added to record how long it took the respondents to make the first and second clicks on the Web page. The perceived value of the Web pages was measured through questions about users' general perceptions of the website, perceived navigation experience, and perceived quality and quantity of information.

The steps for developing a heat map question in Qualtrics, for this example, are described in this article. When performing a usability test using heat maps in Qualtrics, this article can be considered as an example. Note that online survey tools utilize heat maps differently and the specific procedures may vary; refer to the specific online survey program's help menu to learn how to use heat maps in particular survey applications.

Developing your question

Develop user- or audience-based questions to determine how well the user finds information. Example statements for your questions:

- Please click on the area of the following image where your eye went first when you looked at the page.
- Please click on the area where you would most likely click first were you visiting this page.
- Please click where you would go to find information about...
- Please click on the area that attracts your eye the most.
- Please click on the area you think needs improvement.

Take a photograph or screenshot of your communication material to be used in the question. In Figure 2, a screenshot of the mobile version of the "Don't Pack A Pest" website was used to generate the heat map question.

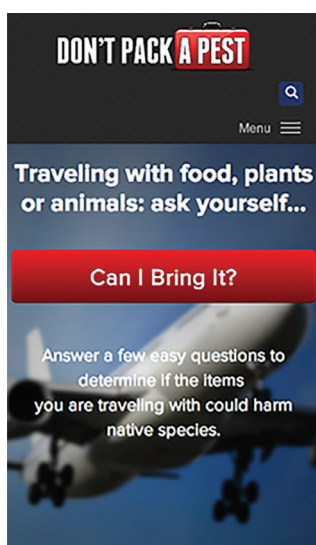


Figure 2. Screen capture of the "Don't Pack a Pest" website (mobile version)

Incorporating your Question into Qualtrics

1. Select "Heat Map" as the question "Item Type" inside Qualtrics (different terms may be used with different software applications).
2. Select "Choose Graphic" to upload the screenshot or photograph into Qualtrics (see Figure 3).

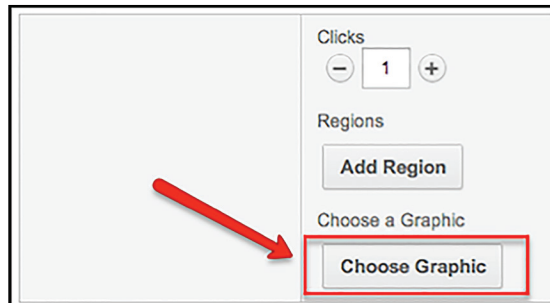


Figure 3. Screen capture of "Choose Graphic" to upload into Qualtrics (Qualtrics, 2015a)

3. Enter the question in the question box (see Figure 4).

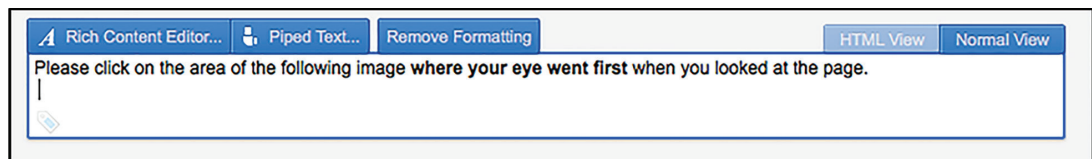


Figure 4. Screen capture of enter heat map question in Qualtrics

4. Enter the number of clicks on the page that the respondent is allowed to make (see Figure 5).

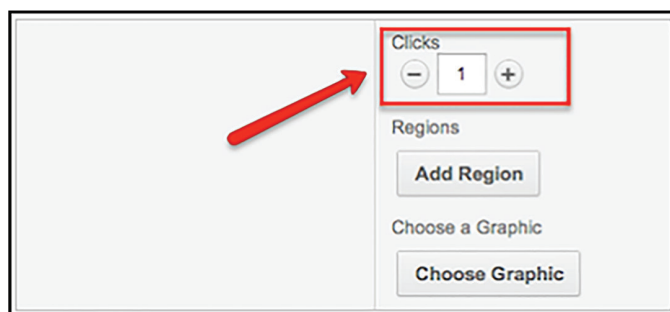


Figure 5. Screen capture of enter the number of clicks allowable for respondents (Qualtrics, 2015a)

Evaluating Timing and Value

Timing. Add a timing question before the heat map question to evaluate how long it took the respondent to click on the communication material to answer the question at hand. The survey respondents will not be displayed with the timing question (Qualtrics, 2015b). Instead, the timing question will only help the researcher to show how long it took the respondent to answer the question or complete the task. Figure 6 displays how to select a timing question from within Qualtrics.

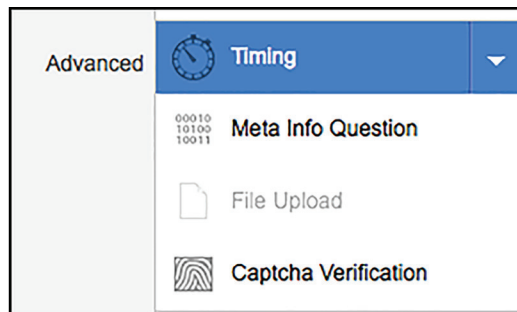


Figure 6. Screen capture of Qualtrics timing question (Qualtrics, 2015a)

Value. Add a value question after the heat map question to evaluate the value of the communication tool. You may incorporate Likert-type, semantic differential, and multiple-choice questions to evaluate the value of the tool see Figures 7, 8 and 9).

Likert-type question. Likert-type questions are used to assess respondents' levels of agreement or satisfaction with statements (see Figure 7). Example Likert-type statements for your heat map questions:

- Please indicate your level of agreement or disagreement with the following statements about the website.
- Please indicate your level of satisfaction with the following statements about the website.

We are now interested in your general opinions about the website. Please spend some time navigating the [Don't Pack a Pest website](#) before responding to the following questions.

Please indicate your level of agreement or disagreement with the following statements about the general look and feel of the website.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I like the colors on the website	☐	☐	☐	☐	☐
I like the format of the website	☐	☐	☐	☐	☐
I like the images and graphics on the website	☐	☐	☐	☐	☐
I believe there are distracting elements on the website	☐	☐	☐	☐	☐

Figure 7. Screen capture of Likert-type questions in Qualtrics

Semantic differential question. Semantic differential questions should be used to determine respondents' attitudes toward a specific concept (see Figure 8) Semantic differential questions are used to determine where respondents fall between two opposite ends of a spectrum. For example:

- Please respond to the following items by marking the circle most closely aligned with how you feel based on the two options provided:
- I found the information presented on the website to be:
 - o Simple, complex
 - o Incomplete, complete
 - o Hard to understand, easy to understand

Please respond to the following items by marking the circle most closely aligned with how you feel based on the two options provided.

When trying to find out if I could bring goat meat into the U.S. from the Cayman Islands, I found the information presented on the website to be:

Simple	☐ ☐ ☐ ☐ ☐	Complex
Not complete	☐ ☐ ☐ ☐ ☐	Complete
Hard to understand	☐ ☐ ☐ ☐ ☐	Easy to understand

Figure 8. Screen capture of semantic differential question in Qualtrics

Multiple-choice question. As seen in Figure 9, multiple-choice questions should be used to gather specific points of information about the respondents' experiences with the communication tool. In this example, the multiple-choice question asked respondents where they found specific information on the website. The following multiple choice question example evaluates how easy information was found on the website: Please select the location on the website where bringing garlic from Puerto Rico was found.

Please select the location on the website where bringing garlic from Puerto Rico was found.

- ☐ Travel guidelines page
- ☐ Alerts and notices page
- ☐ Can I bring it page
- ☐ Home page

Figure 9. Screen capture of multiple-choice question in Qualtrics

Analyzing Data in a Heat Map

As the respondent completes the survey, the data will be recorded by Qualtrics. The heat map can be observed to discover areas where the respondent clicked the most frequently. This information will be displayed in a heat map. The higher the frequency of clicks in a specific location, the more red the area is or the "hotter" the map is. In Figure 10, respondents were most likely to click on Pest and on the Can I Bring It logo.

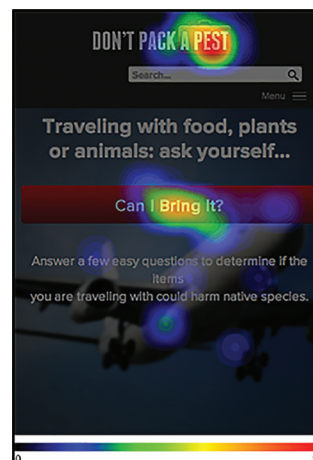


Figure 10. Screen capture of "Don't Pack a Pest" heat map

Defining regions for quantitative data analysis. Custom region shapes may be added or drawn around certain images within the communications tool (see Figure 11). By creating custom regions, the researcher is able to see how many people clicked in a specific area. In Figure 11, a region was drawn around the “Can I Bring It?” button.

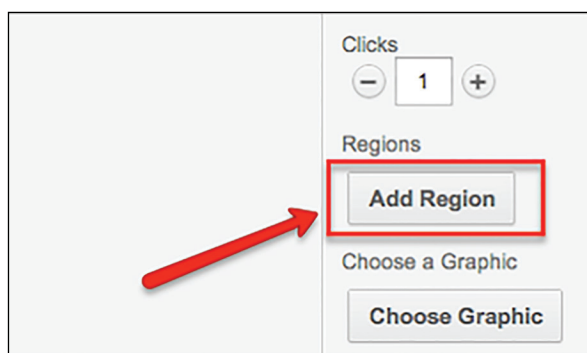


Figure 11. Screen capture of adding a custom region to a heat map area in Qualtrics (Qualtrics, 2015a)

Qualtrics will then output a summary of the number of people who clicked in a specific region such as “Can I Bring It.” In Figure 12, there were 53 responses. Twenty-four of the respondents (45 %) clicked in the “Can I Bring It” logo, while 29 (55%) clicked in other areas of the communication tool.

Region		Response	%
Can I Bring It		24	45%
Other		29	55%

Table Options

Statistic	Value
Total Responses	53

Figure 12. Screen capture of table generated through Qualtrics

Interpreting Results of a Usability Test

Inside of your survey platform, a heat map will be generated on top of the image you uploaded. The heat map shows the amount of people who clicked in a specific location. As previously stated, the more red the area is, the more respondents clicked in the specific location. The observation of the heat map allows the researcher to understand the most frequently clicked-on area of the heat map. While the interpretation depends upon the specific research question asked, understanding the most frequently clicked area will help the researcher in understanding where the respondents were most likely to click for the information asked in the research question.

When the researcher defines regions, or areas, the researcher will be able to gather a frequency count of the amount of respondents who clicked in the area. By using a defined region, the researcher will have an opportunity to see the usefulness of certain aspects of a communication material. For example, a researcher may want to direct website users’ attention to the header of a website. By creating a defined region around the header of the website, the researcher will be able to see how many respondents clicked on the header. Further, when paired with a timing question, the researcher

will understand how long the respondents spend to click on the communication material or find the information. While knowledge of frequency counts will allow the researcher to understand where the respondent went for information, the researcher may also want to know how the respondent valued the information. By asking value-based questions, the researcher can understand how well the respondent interpreted the information they found or their attitudes toward the information.

Agricultural communications researchers and practitioners can use these types of questions to understand the respondents' perception and attitude toward the use of design and information presented on the communication material. Based on the results, agricultural communications professionals could make revisions to their communication materials to meet the needs of the respondents. Further, the usability test can help the researcher to understand how well specific graphics or text blocks were interpreted. If the results indicated a scattering of responses or a mix of interpretation of information, then the material should be edited and redesigned for clarity or graphics.

Interpretation of Results from the Example

In the Don't Pack a Pest example, the results indicated respondents generally focused on the highlighted website elements, such as buttons with larger text and highlighted objects. The results showed click timing varied among the mobile, tablet, and desktop computer platforms, with desktop users taking the most time to make a decision on where to click. These results show areas where communicators need to focus their attention to improve usability, such as emphasizing important areas with larger buttons, text, and highlights. Additionally, respondents took less time on platforms that had less information displayed on the website. While there is value in the information on the homepage, the homepage should be concise and simple to attract users to the most important place in a shorter amount of time. These results also show communicators how website information should be even more concise when it is displayed on mobile and tablet devices than it is on desktop computers.

CONCLUSION

By using a heat map as a tool to evaluate communication materials, agricultural communication professionals and researchers can understand how their target audiences use the information found in specific communication materials, such as websites. By understanding how a communication material is used by a target audience, the agricultural communicator can provide recommendations or adjust the communication material to fit the needs of the target audience. Usability test tools, such as heat maps, have the ability to improve communication messages and strategies between information senders and receivers; therefore, these usability tools can help agricultural communication professionals to develop communication materials suited to the needs of their target audience.

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RESEARCH

Fairgoers' Attitudes Toward Youth Livestock Exhibits at the California State Fair

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ABSTRACT

Developing public and policy maker understanding of agriculture and natural resources is a national research priority of the American Association for Agricultural Education. Because of cultural and geographic distancing from agriculture, consumers' ability to obtain firsthand knowledge of agriculture may be limited to a handful of experiences including local, county, and state fairs. As such, agriculturalists' opportunities to communicate with the public about production agriculture may be limited to these experiences. Youth livestock exhibitors fill a gap in the agricultural education system. While a body of research exists about agricultural literacy among youth and adult groups, few studies exist concerning the impact of youth livestock show exhibits upon fairgoers. This study employed a survey research method using semantic differential scales with a then-now approach. Fairgoers, who had been through the youth livestock exhibits at the California State Fair, were asked about their attitudes toward the exhibits. Findings led to the conclusion viewing livestock exhibits and interacting with youth exhibitors resulted in fairgoers having more positive attitudes toward animal agriculture. Interaction between fairgoers and livestock exhibits should be encouraged and exhibitors should be prepared to view interactions with fairgoers as opportunities to educate about agriculture.

KEY WORDS

California, Fair, Literacy, Livestock Exhibits, Semantic Differential, Youth

INTRODUCTION

Agricultural fairs, or exhibitions, began as a means of trade for merchants from different countries (International Association of Fairs and Exhibitions, n.d.). Although it is not known for certain, according to the International Association of Fairs and Exhibitions, fairs existed as early as 500 BC (International Association of Fairs and Exhibitions, n.d.). The root meaning of the word fair is the Latin word *feria*, which suggests in addition to trade, fairs served as a place of worship (International Association of Fairs and Exhibitions, n.d.). The partnership between fairs and churches was logical, considering worship as well as trade typically was concentrated in large cities. According to the International Association of Fairs and Exhibitions (n.d.), churches actually sponsored fairs during the early Christian era.

Efforts to preserve the educational components of fairs are being made to enhance fairgoers' agricultural knowledge. Recently, fairs and shows have been used as a means to re-imagine British agriculture by improving consumers' agricultural knowledge and perceptions (Holloway, 2004). "Shows are used to stage encounters and exchanges between farming and the non-farming public, which are increasingly rare in societies where many experience a distancing between themselves and the way their food is produced" (Holloway, 2004, p. 321). Holloway (2004) mentioned this shift might align fairs in the United Kingdom with those in North America. Being aware of how the presence of livestock at shows helps to impact the public, both breed associations and youth exhibitors were asked to become directly involved in promoting agriculture at shows. Similar educational efforts are evident in North American shows.

Today, over 3,200 fairs are held each year in North America. They provide industrial exhibits, demonstrations and competitions aimed at the advancement of livestock, horticulture and agriculture with special emphasis placed on educational activities such as 4-H, FFA and similar youth development programs. (International Association of Fairs and Exhibitions, n.d., para. 12)

According to the Environmental Protection Agency (EPA) (2009), less than 1% of the population claims farming as their occupation and about 2% of the population lives on a farm. With this percentage dwindling, the majority of the population is becoming farther removed from production agriculture (EPA, 2009; Wachenheim & Rathge, 2002). As a result, "most Americans, whether young or old, have limited knowledge about agriculture and food production" (Frick, Machtmes, & Birkenholz, 1995, p. 44). Many would agree, however, a basic understanding of agriculture and problems facing the industry would prove beneficial for both consumers and producers (Frick et al., 1995). An increased understanding could lead to better management of food supplies and resources (Frick et al., 1995).

Consumers who are removed from agriculture can be influenced by experiences and interactions with agriculturalists, such as attending county and state fairs (Godfrey & Wood, 2003; Diem & Rothenburger, 2001; Goodwin, Chiarelli, & Irani, 2011). Although studies have been conducted to describe agricultural knowledge and perceptions (Tolman, 2009; Wachenheim & Rathge, 2002), little research has been conducted at fairs, which is the only interaction some people have with production agriculture. After all, perceptions of agriculture influence the agricultural industry via consumers' buying and voting power (Wachenheim & Rathge, 2002).

Every year at the California State Fair, members of 4-H and FFA organizations enter exhibits to demonstrate competencies in their selected projects (California State Fair, n.d.). The fair, which runs for two weeks in July, is held in the State's capitol city of Sacramento (California State Fair, n.d.). It first opened at its current location in 1968 and in 2011 had more than 521,000 attendees (California State Fair, n.d.). The fair features carnival rides and games, horse racing, a water park, exhibit buildings filled with vendors, and competitive livestock shows and exhibits.

During the fair, the public can watch 4-H and FFA members compete for championship honors both in and out of the show ring. Recognizing the need for the youth to understand that showing livestock serves as an opportunity to educate the public about these projects, the fair hosts an educational display competition (California State Fair, n.d.). These displays serve as outreach for the public to gain greater understanding about the youth and their efforts in addition to agriculture as a whole (California State Fair, n.d.). Additionally, youth are often available for conversations regarding their roles in the agricultural industry. This intrapersonal communication is a factor in the public opinion process (Hoffman, Glynn, Huge, Sietman, & Thomson, 2007). Finally, breed and specie organizations typically attend fairs to interact with the public, who may only experience agriculture through this lens (Holloway, 2004).

As people become farther removed from agriculture, their interaction with production agriculture decreases (Wachenheim & Rathge, 2000). Consequently, agricultural literacy is diminished and perceptions of the industry are formed based on minimal hands-on experience with, and possible misrepresentations of, the industry (Turnbull, 2002).

A report from the California Postsecondary Education Commission (2007) indicated a majority of Californians ages 25-64 have had some post-secondary education. However, because a large portion of the population lives in urban and suburban areas, people's ability to obtain firsthand knowledge of agriculture may be limited to annual local, county, or state fairs (Turnbull, 2002). As a result, agriculturalists' opportunities to communicate with the public about agriculture may be limited to a handful of these experiences. A review of literature revealed little research exists that indicates what influence, if any, attending fairs has on fairgoers' attitudes toward youth livestock fair exhibits.

THEORETICAL FRAMEWORK: SOCIAL REPRESENTATION THEORY

Social representation theory is used to create understanding between expert and non-expert audiences through both discourse and imagery (Halfaree, 1993). This theory, developed primarily by Serge Moscovici, seeks to “outline how people understand, explain and articulate the complexity of stimuli and experiences emanating from the social and physical environment” (Halfaree, 1993, p. 29). A person’s perceptions and understanding of a concept are influenced by their predispositions and experiences with the subject (Moscovici, 2001). Moscovici (2001) noted the world, as people perceive it, is a result of responses to stimuli from the physical environment and the quasi-physical environments they live in.

One unique characteristic of social representation theory is how new information is processed and unfamiliar situations are integrated into concepts and ideas already understood by individuals (Buijs, et al., 2012). Buijs et al. (2012) explained anchoring allows new representations to be linked to concepts already understood. “Objectification allows an abstract thing to become concrete through projecting abstract constructs as concrete images, which then come to stand for the new phenomenon” (Buijs et al., 2012, p. 1170). Moscovici (2001) noted when we think about an unfamiliar concept, our images, learned habits, memories, and genetic predisposition all combine to make the concept as we imagine it. Social representations are linked to social groups and people who experience them; however, individuals interpret and internalize them differently based on discourse about the topic with experts and previous perceptions (Halfaree, 1993). Representations symbolize a specific means of communicating and understanding; they provide an idea for every image and from there, provide meaning, understanding, and significance to everyday life (Moscovici, 2001; Buijs et al., 2012).

Moscovici (2001) stated sometimes perceptions are misguided by “a pre-established fragmentation of reality, a classification of the people and things, which comprise it” (p. 19). Moscovici (2001) noted it is not uncommon that some previously assumed facts, basic to understanding and conduct, turn out to be misconceptions. Knowledge is gained by engaging in communication and imagery about the abstract and unfamiliar (Moscovici, 2001). Because the world we live in is social, Moscovici (2001) stated all information we receive is distorted to some degree. Duncan and Broyles (2006) noted after experiencing a concept, people tend to perceive that concept more accurately.

Until recently, only a handful of agriculturally related studies used social representation theory as a framework (Buijs et al., 2012). However, studies have recently been published that “illustrate how the theory of social representations can be used to deepen our understanding of disputes over land management and of how people conceptualize nature and natural resources” (Buijs et al., 2012, p. 1168). Halfaree (1993) suggested using this theory to develop a more encompassing definition and understanding of the rural. Halfaree (1993) agreed with Buijs et al.’s (2012) contention that social representations allow individuals to conceptualize new objects, events, and persons but also noted understating the representations allows people to guide behaviors.

Researchers seem to agree the social property is deeply engrained in the theory (Buijs et al., 2012, Halfaree, 1995; Holloway 2004; Moscovici, 2001). “They [representations] are consensual means of making the unfamiliar, but this consensus is group specific. Only those who share a representation will use it the same way” (Halfaree, 1993, p. 30). Moreover, Halfaree (1993) stated social representations are inherently social due to the linkage to the communication process. Holloway (2004) also emphasized the communication process when he discussed this theory as the foundation of an effort to re-imagine British agriculture. He used the input from the chairs of several large agricultural societies, breed societies, and pedigreed breeders to determine what concepts should be focused on when engaging in social representations to educate the public at shows (Holloway, 2004). Holloway mentioned seeking to improve agricultural education and, in turn, agricultural perceptions might bring these shows in line with the North American model of agricultural shows.

Livestock and agricultural shows were targeted as points of convergence between farming and non-farming communities, which were said to be central to the effort of re-imaging agriculture and transferring agricultural knowledge (Holloway, 2004). Holloway (2004) stated, “shows are used to stage encounters and exchange between farming and the non-farming public, which are increasingly rare in societies where many experience a distancing between themselves and

the way their food is produced” (p. 321). Focused on the opportunity to present a specific image of agriculture, breed associations, and livestock exhibitors were asked to help promote a positive image of agriculture (Holloway, 2004).

PURPOSE/OBJECTIVES

The purpose of this study was to determine if visiting livestock exhibits at a state fair impacts fairgoers’ attitudes toward livestock exhibits. According to the American Association for Agricultural Education’s 2011-2015 National Research Agenda (Doerfert, 2011) it is important consumers have “an accurate understanding of and informed opinions about agriculture and natural resources (p. 11).” The specific objectives guiding this study were:

1. Describe fairgoers at the California State Fair based upon age, sex, ethnicity, race, education, current residency, livestock ownership, 4-H and/or FFA experience, occupation, if they had family members who lived on a farm, and time spent viewing the exhibits.
2. Identify the fairgoers’ attitudes about livestock fair exhibits at a state fair before viewing the livestock exhibits.
3. Identify the fairgoers’ attitudes about livestock fair exhibits at a state fair after viewing the livestock exhibits.
4. Determine if visiting the livestock exhibits impacted fairgoers’ attitudes about livestock fair exhibits.

METHODS/PROCEDURES

The population for this study consisted of adult fairgoers who attended the California State Fair on July 14, 2012. During this time, a convenience sample of the population, composed of people near the livestock exhibits, was identified to participate in the study. Sponsorship funds were available to support a sample of 400 people. One individual did not wish to take the participation incentive, which allowed an additional person to take the questionnaire. This process resulted in a sample size of 401 subjects. Of these, 395 responses were deemed usable. This population is only representative of people who attended the fair and were near the livestock exhibits during the specified times. As a result of this sampling method, conclusions of this study cannot be generalized to everyone who attended the California State Fair.

This study was intended to describe fairgoers’ attitudes before and after viewing the livestock exhibits and whether visiting the exhibits impacted their opinions of youth livestock exhibits at the California State Fair. The instrument was administered after fairgoers visited the livestock animal exhibits, which required participants to retrospectively assess their initial opinion of the livestock exhibits. This then-now approach is an accepted procedure for collecting attitudinal data (Townsend & Wilton, 2003).

The questionnaire consisted of 11 items to gather data about participants’ age, sex, race, ethnicity, education, 4-H and FFA experience, and residency. These questions were developed based on questions included in the U.S. Census (2010) and modified questions from Frick, Machtmes, and Birkenholz’s (1995) study of agricultural literacy. Fairgoers also were asked how long they spent in the exhibits, and why they attended the fair.

The instrument included two tables of semantic differential scales (Osgood, Suci & Tannenbaum, 1965) to assess attitudes of fairgoers before and after viewing exhibits. A semantic differential is composed of dichotomous terms separated by a seven-point scale (Osgood et al., 1965). Osgood et al. (1965) designed the semantic differential to objectively measure three attitudinal factors: evaluative, potency and activity. The stem question for the semantic differentials on this instrument was: “Youth Livestock Exhibits at the California State Fair are.”

The instrument was reviewed for content and face validity by a panel of five experts from the College of Agricultural Sciences and Natural Resources at Oklahoma State University as well as individuals involved in livestock shows and youth competitions from California and Oklahoma. The panel provided feedback and suggestions on both the content

and format of the questionnaire. The experts suggested modifications for the format of tables and the wording of some demographic questions.

A pilot study was conducted at a county fair located in the same geographic area as the California State Fair. Thirty people participated in the pilot. Feedback from participants indicated some ambiguity existed regarding some of the selected word pairs. As a result of this finding and further discussion about the purpose of the study, we determined to focus only on assessing the evaluative attitude factor. According to Isaac and Michael (1982), word pair selection should be based on relevance and appropriateness to the topic. Consequently, new word pairs were selected from a list by Osgood et al. (1965). A Cronbach's alpha reliability analysis was conducted on the items resulting in a .85 for the then table and .83 for the now table.

Data collection for this research was conducted on one day at California State Fair. One of the researchers and 15 trained volunteers identified subjects and administered the questionnaire. The volunteers were trained in the morning prior to starting the data collection process. Volunteers were instructed to respond to questions regarding the instrument by stating only that each question was to be answered based on the participant's interpretation of the question. Furthermore, volunteers were instructed to have participants, especially those in pairs or groups, take the questionnaire independently. Volunteers were broken into groups and assigned tasks, which included soliciting fairgoers to participate, managing the booth where participants filled out the questionnaire, collection of complete questionnaires, and distribution of incentive funds.

To qualify as a subject in the study, a participant had to be at least 18 years of age, could not know anyone exhibiting livestock, and had to have visited the livestock exhibition barn that day. During the entire data collection period, breeding swine and breeding sheep shows were taking place in the livestock exhibit barn. Fairgoers had the opportunity to view those shows from bleachers surrounding the show rings and walk through other areas of the facility. Announcers for each show often provided industry facts and described activities taking place in the show ring to further enhance the educational aspect of the show. Subjects who completed the instrument were provided \$5 cash as an incentive for participating in the study.

Data analysis for the first objective consisted of descriptive statistics including frequencies and appropriate measures of central tendency. Means were calculated for constructs associated with the semantic differentials. A paired samples *t* test was used to determine if the change in perceptions was significant. The confidence level for this study was set at $\alpha = .05$, a priori.

FINDINGS

Findings Related to Objective 1: Description of the Subjects

Participants in this study were asked to respond to items indicating their age, sex, ethnicity, race, education, current residency status, livestock ownership, 4-H experience, FFA experience, if they have relatives who live on a farm, and if they have worked in agriculture. They also were asked how much time they spent in the livestock exhibits while at the fair.

Of the 395 respondents, 377 provided their age. The youngest participants were 18 years old and the oldest was 80 years old. Nearly 39% ($n = 146$) were between 18 and 35 years old. Nearly 55% ($n = 206$) were between 36 and 55, while almost 19% ($f = 71$) were more than 55 years old. More than half (58.2%, $f = 219$) of the respondents were female. Of the 373 participants who provided their ethnicity, 13.1% ($n = 46$) identified themselves as Hispanic and 86.9% ($n = 324$) identified themselves as non-Hispanic. Of the respondents who provide their race ($n = 376$), 77.9% ($n = 293$) identified themselves as white, 1.6% ($n = 6$) identified themselves as African American, 4.8% ($n = 18$) indicated they were Asian, 1.3% ($n = 5$) identified themselves as American Indians or Alaska Native, 1.9% ($n = 7$) identified themselves as some other race, and 12.5% ($n = 47$) identified themselves as being two or more races. No respondents identified themselves as Native Hawaiian or other Pacific Islander. The questionnaire revealed that for 18.2% ($n = 72$) of respondents, high school

was the highest level of education achieved. More than one-third (35.4%, $n = 140$) had completed some college, 29.9% ($n = 118$) had obtained a bachelor's degree, and 16.5% ($n = 65$) had a graduate degree.

Of the respondents ($n = 391$), 3.6% ($n = 14$) said they lived on a farm, 12.9% ($n = 51$) indicated they lived in a rural area, 60.8% ($n = 240$) identified their residence as suburban, and 21.8% ($n = 86$) indicated they were urban residents. Respondents were asked if they had ever owned livestock. Just more than one-third, 35.2% ($n = 135$), had owned livestock and 64.8% ($n = 249$) indicated they had not owned livestock. Of the 389 respondents, 14.9% ($n = 58$) had participated in 4-H and 85.1% ($n = 331$) had not participated in 4-H. Of the 58 who participated in 4-H, 38 responded with the number of years they participated. The responses ranged from 1 to 12 years, with 63.2% ($n = 24$) of respondents indicating they participated for five or fewer years. Of the 387 respondents, 7.1% ($n = 28$) indicated they participated in FFA and 90.9% ($n = 359$) indicated they had not participated in FFA. Of the 28 who participated in FFA, 16 responded with the number of years they participated. The responses ranged from 1 to 6 years, and 43.9% ($n = 7$) responded they participated for three or fewer years. Of the 395 respondents, 42.5% ($n = 168$) of respondents indicated they had a relative who lived on a farm, and 57.5% ($n = 227$) said they did not have a relative who lived on a farm. Of the 392 respondents, 5.1% ($n = 20$) indicated they worked in agriculture, and 94.9% ($n = 372$) said they did not work in agriculture.

Participants were asked to estimate how long they spent in the livestock exhibits. Of the 380 respondents, 9.7% ($n = 37$) spent 10 minutes or less, 33.2% ($n = 12$) spent 11-20 minutes, 29.7% ($n = 113$) indicated they spent 21-30 minutes, 5.5% ($n = 21$) spent 31-40 minutes, 10.8% ($n = 41$) spent between 41-50 minutes, 9.2% ($n = 35$) spent 51-60 minutes, and 1.8% ($n = 7$) indicated they spent more than 60 minutes in the exhibits.

Findings Related to Objective 2: Attitudes About Youth Livestock Exhibits Before Visiting Livestock Exhibits

The second objective was designed to describe participants' evaluative attitude about youth livestock exhibits prior to visiting the youth livestock exhibits at the California State Fair. Ten of the 12 dichotomous pairs had a mode of 7, the most positive response possible. Slightly more than 50% ($f = 198$) of the respondents marked 7 for the work pair Negative/Positive. More than 40% of the respondents marked 7 for five pairs and more than 30% of the respondents marked 7 for four other pairs. The only two pairs that did not have a mode of 7 were Ugly/Beautiful and Dirty/Clean, each of which had a mode of 4, correlating with a neutral or undecided response. These data are displayed in Table 1.

Table 1

Semantic Differential Scales Associated with Attitude Prior to Viewing Livestock Exhibits

Negative Item	1 <i>f</i> %	2 <i>f</i> %	3 <i>f</i> %	4 <i>f</i> %	5 <i>f</i> %	6 <i>f</i> %	7 <i>f</i> %	Positive Item
Negative	0 0.0	5 1.3	8 2.0	48 12.2	55 13.9	81 20.5	198 50.1	Positive
Worthless	1 0.3	3 0.8	8 2.0	50 12.7	51 12.9	100 25.3	182 46.1	Valuable
Bad	0 0.0	1 0.3	11 2.8	63 15.9	60 15.2	81 20.5	179 45.3	Good
Dishonest	1 0.3	5 1.3	5 1.3	70 17.8	60 15.2	81 20.5	172 43.7	Honest
Unimportant	2 0.5	6 1.5	20 5.1	57 14.5	68 17.3	69 17.6	170 43.3	Important
Sad	2 0.5	1 0.3	15 3.8	56 14.3	77 19.6	77 19.6	164 41.8	Happy
Cruel	4 1.0	8 2.0	20 5.1	53 13.4	49 12.6	105 26.6	156 39.5	Kind
Unpleasant	0 0.0	7 1.8	14 3.6	62 15.8	72 18.4	85 21.7	152 38.8	Pleasant
Boring	8 2.0	19 4.8	25 6.3	48 12.2	62 15.8	93 23.6	139 35.3	Interesting
Unsuccessful	1 0.3	2 0.5	12 3.1	77 19.7	77 19.7	86 22.0	136 34.7	Successful

Ugly	2	0.5	10	2.5	37	9.4	106	26.9	85	21.6	68	17.3	86	21.8	Beautiful
Dirty	22	5.6	33	8.4	68	17.3	89	22.6	52	13.2	64	16.3	65	16.5	Clean

Note. Modal responses are boldfaced.

Findings Related to Objective 3: Attitudes About Youth Livestock Exhibits After Visiting Livestock Exhibits

The third objective was designed to describe participants' evaluative attitude about youth livestock exhibits after visiting the youth livestock exhibits at the California State Fair. Eleven of the 12 dichotomous pairs had a mode of 7, the most positive response possible. More than 50% of the respondents marked 7 for 8 of the 12 pairs. The pair with the highest modal response was Unsuccessful/Successful with 58.4% ($f = 230$) marking 7. More than 40% of the respondents marked 7 for two pairs and more than 30% of the respondents marked 7 for one other pair. The only pair that did not have a mode of 7 was Clean/Dirty, which had a mode of 6. These data are displayed in Table 1.

Findings Related to Objective 4: Difference Between Fairgoers' Attitude Before and After Viewing Livestock Exhibits

A paired-samples t test was conducted to detect differences in subjects' attitude after viewing the livestock exhibits. Responses for the 12 word pairs were summed to calculate a mean score for the evaluative attitude scales collected before visiting the livestock exhibits. The same calculation was done for the evaluative attitude scales collected after visiting the livestock exhibits. The mean for attitude before viewing the livestock exhibits was 67.35 with a standard deviation of 12.36. The mean for attitude after viewing livestock exhibits was 73.04 with a standard deviation of 10.30 (see Table 3). A paired-samples t test was used to evaluate change in attitudes before and after viewing the exhibits. The difference was statistically significant at the specified .05 level, $t(375) = -13.20$, $p < .001$. To determine the practical significance, a Cohen's d effect size was calculated. This statistic demonstrates the practical significance the exhibits had on participants' attitudes. To determine the effect size, the mean difference was divided by the pooled standard deviation (Thalheimer & Cook, 2002). To establish this value, the mean for attitude before viewing exhibits was subtracted from the mean for attitude after viewing exhibits and divided by the pooled standard deviation, $73.04 - 67.35 / 11.33 = 0.5$. According to Cohen (1992), 0.5 represents a medium effect size.

CONCLUSIONS RECOMMENDATION AND IMPLICATIONS

Objective 1

The typical respondent to this study is a middle-aged, suburbanite female with at least some higher education. She has never owned livestock or been involved in 4-H or FFA, and has not worked in agriculture. She viewed the livestock exhibits briefly.

The general demographic makeup of participants with regard to sex, age, race, and ethnicity is fairly consistent with the 2010 census information for California (U.S. Census Bureau, 2010). However, the proportion of Hispanic participants is much lower, at 13% when compared to the general California population, which is more than 37% (U.S. Census Bureau, 2010). The low percentage of Hispanic respondents is a curiosity. This occurrence could be due to the fact that the questionnaire was available in English only, thus inhibiting Hispanics from participating in the study. If the study is replicated, the questionnaire should be translated into Spanish to facilitate Spanish speakers'/readers' participation in the study.

Table 2*Semantic Differential Scales Associated with Attitude After Viewing Livestock Exhibits*

Negative Item	1 f %	2 f %	3 f %	4 f %	5 f %	6 f %	7 f %	Positive Item
Unsuccessful	0 2	3 0.8	3 0.8	15 3.8	34 8.6	109 27.7	230 58.4	Successful
Negative	0 0.0	2 0.5	6 1.5	10 2.5	40 10.1	109 27.6	228 57.7	Positive
Boring	0 0.0	3 0.8	1 0.3	26 6.6	33 8.4	112 28.5	218 55.5	Interesting
Unimportant	1 0.3	1 0.6	6 1.5	18 4.6	41 10.4	106 26.9	221 56.1	Important
Worthless	1 0.3	2 0.5	11 2.8	13 3.3	45 11.4	107 27.1	216 54.7	Valuable
Dirty	1 0.3	2 0.5	4 1.0	16 4.1	56 14.2	102 25.8	214 54.2	Clean
Cruel	0 1.5	3 0.8	2 0.5	31 7.9	1 10.4	110 27.9	207 52.5	Kind
Bad	2 0.5	6 1.5	7 1.8	26 6.6	63 16.0	88 22.3	202 51.3	Good
Unpleasant	6 0.0	13 3.3	21 5.3	21 5.3	37 9.4	103 26.2	192 48.9	Pleasant
Ugly	9 3	12 3.3	11 2.8	28 7.1	42 10.6	111 28.1	181 45.8	Beautiful
Sad	1 0.0	3 0.8	15 3.8	61 15.5	70 17.8	98 25.1	146 37.1	Happy
Dishonest	11 2.8	24 6.1	41 10.5	57 14.6	66 16.9	98 25.1	94 24.0	Honest

Note. Modal responses are boldfaced.

Table 3*Then/Now paired-Samples t Test*

Data Set	<i>n</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Summed Then	376	67.35	12.36	—	—
Summed Now	376	73.04	10.3	-13.202	.0001

df = 374; $\alpha = 0.05$

A report from the California Postsecondary Education Commission (2007), stated just more than 60% of Californians ages 25 to 64, have had some post-secondary education. A higher proportion of the participants in this study (80%) indicated they had completed some college or other higher education. Interestingly, five percent of the participants in this study indicated they are employed in agriculture, which is more than the national average of one percent (EPA, n.d.). This difference might be explained by the fact people employed in agriculture might be more likely to view livestock exhibits.

Results can only be generalized to the 395 participants. Because of the limited time frame during which questionnaires were distributed, this study should be repeated during the other times of the day to determine if participant demographics and responses change based on the time of day. We recommend the study be replicated at county and local fairs in different areas across the state and nation.

Objective 2

Overall, respondents' attitudes about youth livestock exhibits prior to viewing the exhibits are positive. This conclusion may be a result of their previous experiences with or knowledge of agriculture, or even previous experience with the exhibits at the state fair.

Objective 3

Respondents' attitudes toward youth livestock exhibits remain positive after viewing the exhibits. Additionally, after viewing the exhibits the positivity of attitudes for all pairs improved, including beautiful/ugly and clean/dirty. Therefore, we conclude viewing livestock exhibits contributes to more positive attitudes about livestock exhibits. The improvement in attitude is supported by Holloway's (2004) concept of using social representation theory to improve agricultural perceptions.

Duncan and Broyles (2006) stated people more accurately perceive a concept after experiencing it, which supports the improved positivity of perceptions after viewing the exhibits. This improvement demonstrates to agricultural communicators, fair administrators, youth organization leaders, and fair exhibitors that livestock shows make positive contributions to the industry (Diem & Rothenburger, 2001).

Objective 4

The change between evaluative attitude regarding livestock exhibits held by fairgoers before and after viewing such exhibits is statistically significant and has a medium effect size. Therefore, the youth livestock exhibits influenced fairgoers' attitudes toward youth livestock exhibits in a positive way. The most noticeable changes are in opinions of the cleanliness and beauty of the exhibits. Attitudes changed in a positive manner, indicating respondents clarified previous ambiguity they had regarding the exhibits (Holloway, 2004).

Given the medium effect size, it is concluded that although an impact is made, exhibits can be more impactful. To make this impact, club leaders for 4-H and FFA advisors should increase efforts to provide educational exhibits for fairs and ensure youth are available to engage in conversations with fairgoers. Admittedly, a great deal of financial resources and time go into constructing educational displays (Diem & Rothenburger, 2001); however, as demonstrated by this study, doing so does have a payoff in improving perceptions. It may even validate the need for fundraising efforts by agricultural organizations and companies to ensure displays can be improved to increase literacy and awareness of youth projects.

This study supported a British movement to improve perceptions and knowledge of agriculture by increasing communication, interaction, and imagery between farming and non-farming publics (Holloway, 2004). Holloway (2004) stated times of convergence between experts and non-experts, such as fairs, can improve consumer perceptions and increase their knowledge and understanding of agriculture. The intrapersonal communication and imagery provided by the exhibits and exhibitors impacted participants' attitudes (Holloway, 2004; Moscovici, 2001). Therefore, youth organizations such as 4-H and FFA should continue to ensure exhibits are both educational and aesthetically pleasing. As the study indicated, cleanliness and beauty were the two areas with the least positive attitudes.

Holloway (2004) suggested in addition to exhibitors, organizations should also become engaged with fairgoers to further enhance the educational experience at fairs. The same could be said for North American organizations such as the Western Fairs Association and specie organizations. Participation on behalf of these groups might fill an additional educational gap when exhibitors are showing and have less time to interact with fairgoers, as was the case during this study.

Although few previous studies regarding attitudes at fairs have been conducted, the findings agree with studies of agricultural perceptions, which stated participant's perceived agriculture positively (Tolman, 2009; Wachenheim & Rathge, 2002). Although attitudes initially were positive, interaction with agriculturalists improved these; thereby, changing attitudes as Wachenheim and Rathge (2002) indicated was possible.

The social representation theory also states the image of the industry presented is the one people will see and perceive (Moscovici, 2001; Holloway, 2004). It is not unreasonable, therefore, to postulate that fairgoers will extend these positive perceptions of youth livestock exhibits to agriculture as a whole. The results of this study could validate the implementation of a similar re-imaging of American agriculture via annual local, county, and state fairs as a means to improve attitudes about agriculture (Holloway, 2004).

While this study demonstrates the benefit of youth livestock exhibits for improving perceptions, it only described if a change occurred and if it was significant. A qualitative study should be conducted to glean a deeper understanding of how participants' attitudes are formed and altered. Determining what aspects most significantly impact fairgoers' opinions can lead to improved communications strategies by exhibitors. Furthermore, one final area where this study was limited was the reliance on participants' retrospective assessment of the exhibits. Therefore, a true pretest/posttest version of the study should be conducted to determine if the results differ.

Using this understanding of attitudes, agriculturalists can create communication strategies to positively influence consumers' attitudes and understanding of agriculture (Goodwin, Chiarelli, & Irani, 2011). Furthermore, youth organization leaders need to work to ensure their groups are positive liaisons for agriculture by communicating with consumers and having clean and informative displays (Diem & Rothenburger, 2001).

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